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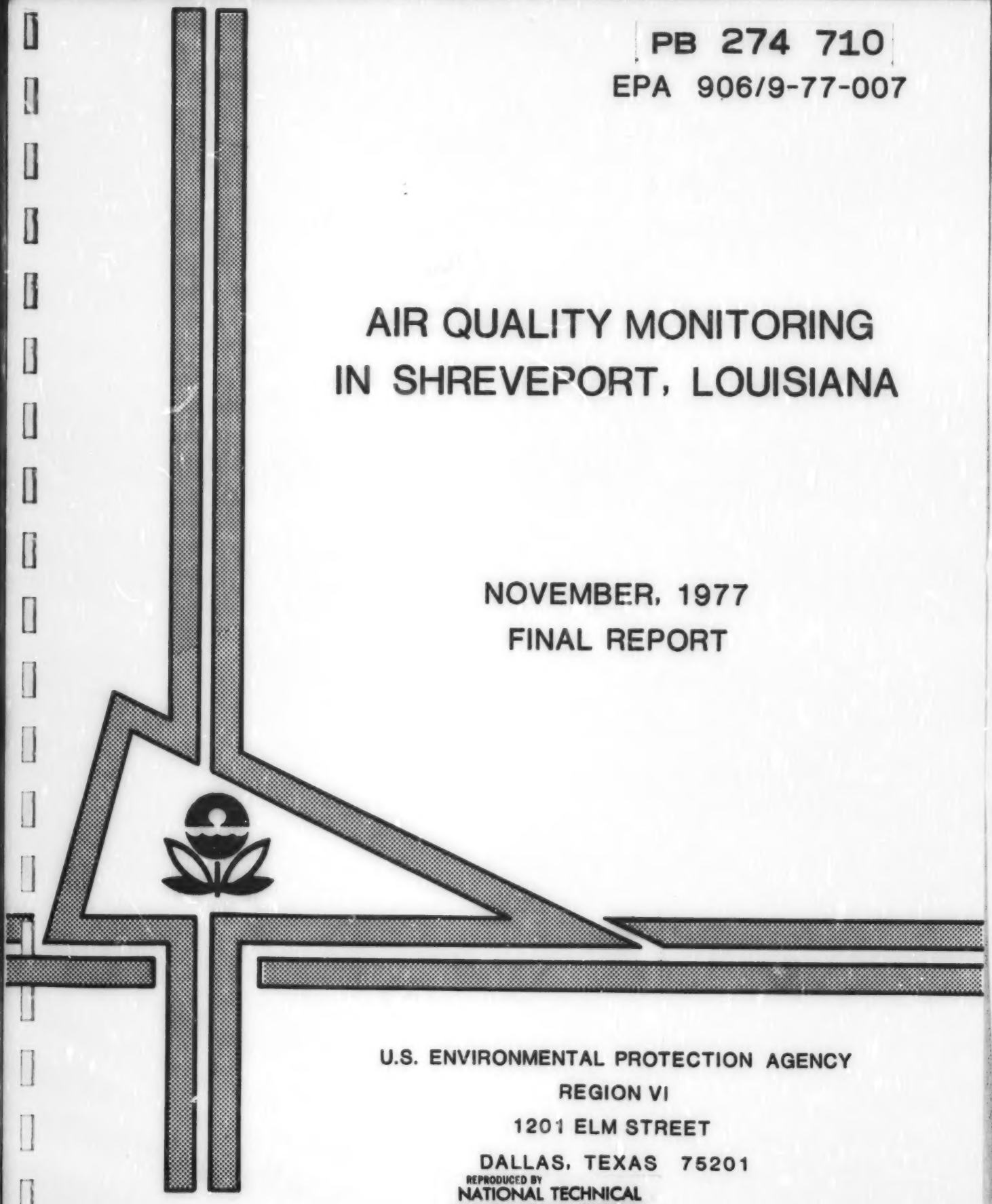
AIR QUALITY MONITORING IN SHREVEPORT, LOUISIANA

NOVEMBER, 1977
FINAL REPORT



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Ambient air quality data for Shreveport, Louisiana were collected and compiled for the period July 21 through September 21, 1977. The ambient concentrations of ozone and oxides of nitrogen were collected on a time-specific basis.

17. KEY WORDS AND DOCUMENT ANALYSIS

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AIR QUALITY MONITORING IN SHREVEPORT, LOUISIANA

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Contract No. 68-02-2538, Task Order No. 1

FINAL REPORT

Prepared for:

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Region VI
Surveillance and Analysis Division
Dallas, Texas 75270

November, 1977

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1.0 INTRODUCTION

The objective of this project was to collect and compile ambient air quality data for Little Rock, Arkansas and Shreveport, Louisiana. This study was conducted under Task Order No. 1 of Basic Ordering Agreement No. 68-02-2538. The data for Shreveport, Louisiana is the subject of this report.

One mobile monitoring station was located in the metropolitan area for sixty days to collect time-specific data on the ambient concentrations of ozone and oxides of nitrogen. The site was located at a municipal airport with National Weather Service facilities, and, therefore, separate meteorological monitoring was not needed. An intensive quality assurance program of calibrations, audits, and zero/span checks was included to verify the validity of the data.

This report presents the data accumulated in this study and describes the equipment and procedures used to obtain that data. Section 2 of this report describes the instruments, data system, and monitoring station. Section 3 describes the quality assurance procedures. Section 4 gives a brief description of the monitoring site. Section 5 summarizes and presents the data for the site including calibration results, audit results, and down time analyses.

2.0 INSTRUMENT SYSTEMS

This section discusses the major components of the monitoring station. The system consisted of air quality instrumentation and a computer-controlled data system housed in a twenty-six foot, fifth-wheel trailer. Figure 2-1 shows a typical configuration of the monitoring station. This station maintains a stable environment ($\pm$ 5°F) for the correct operation of all instruments. Meteorological instrumentation was not provided because the site was located at a municipal airport from which meteorological data are available.

2.1 Air Quality Instrumentation

The Meloy Laboratories Model OA350-2R Ozone Analyzer was used to measure ozone. This instrument continuously measures ozone by the chemiluminescent principle and is EPA-approved as an equivalent method for ozone. The instrument was operated on the approved range of 0-500 ppb.

The Meloy Laboratories Model NA520 Oxides of Nitrogen Analyzer was used to measure NO and NO_x. This instrument uses the chemiluminescent principle of analysis and has dual channels to continuously monitor the NO and NO_x. NO_2 is obtained by subtraction in the data system. The Model NA520 was operated on a 0-500 ppb range.

The air sample was drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system had a 25 mm diameter, and a constant air flow through the system was provided by an air pump rated at 60 cfm at 0" head pressure. The manifold had sampling ports to which ½" teflon lines to the instruments were connected. All joints in the sampling system

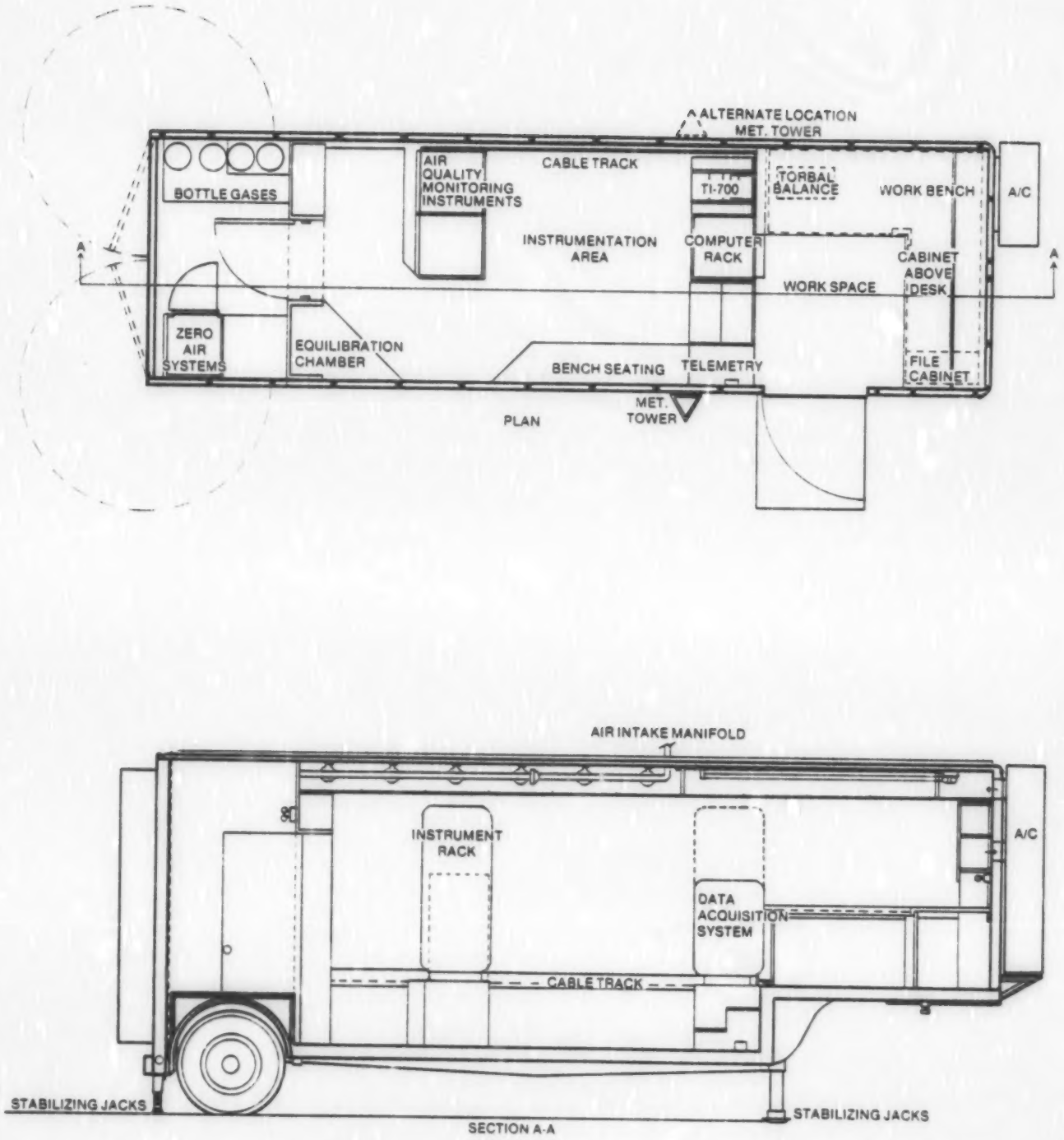

Figure 2-1. Typical Configuration of Monitoring Station

were secured by O-ring compression fittings. The manifold was contained in a heated (100°F) chamber to prevent condensation of moisture.

2.2 Calibration Equipment

A Meloy Laboratories Model CNS 1 calibrator was used for daily automatic zero/span checks on the NO_x analyzer. The ozone analyzer was equipped with an internal span source. A Bendix Model 8851 Dynamic Calibration System was used for multi-point calibrations of both analyzers. Two separate units were used for external audits, a Bendix Model 8861 D Transportable Field Calibration System and a Monitor Labs 8500 R calibrator. Calibration and audit procedures are described in detail in Section 3.

2.3 Data Acquisition System

The station was equipped with its own data acquisition system consisting of five major components.

1) Analog-to-Digital (A/D) System,

2) Data General NOVA 1200 Based Computer Unit and Memory,

3) Texas Instruments KSR-733 Keyboard/Printer,

4) Three Magnetic Tape Cassette Units, and

5) System Status Panel

The basis of the data acquisition system was a Data General NOVA 1200 minicomputer. The NOVA, with a basic cycle time of 1.2 μsec, was equipped with automatic program load and power fail/automatic restart features. The computer utilized 8K 16-bit words of core memory. Analog-to-digital conversion was accomplished via an ADC built by Radian Corporation. The input/output unit for the system was via a teletype keyboard/printer. This teletype provided keyboard entry and hardcopy printed output. The data were also recorded on a cassette magnetic tape unit with three drives. The cassette unit was utilized for program storage and loading as well as recording. The power to the teletype and cassette units was turned on only when the unit(s) was to be used to reduce wear on mechanical parts.

3.0 QUALITY ASSURANCE PROCEDURES

Many factors are important in the collection of acceptable air quality data. These include stable, well-maintained instruments, a suitable environment for those instruments, a well-designed sampling system that provides unaltered samples of the ambient air, reliable reference gases, detailed records of all activities, and proper operating procedures for the monitors. In addition, it is desirable to perform periodic calibrations and control-sample audits to assess the uncertainty in the ambient data.

The monitoring stations at Little Rock and Shreveport were subjected to a stringent quality assurance program in order to substantiate the validity of the data and to detect any possible errors. Emphasis was placed on multi-point calibrations, audits, and zero/span checks. The publication, Guidelines for Development of a Quality Assurance Program; Reference Method for Measurement of Photochemical Oxidants, EPA-73-028c, was used as a guideline.

Calibration, audit, and span values for ozone were based upon the neutral buffered potassium iodide (NBKI) method as written in the Federal Register , Volume 36, No. 84, Part II, April 30, 1971. This technique, although under intense scrutiny, is the reference method for calibrating ozone analyzers. However, the ozone sample values were also checked using both direct and reverse gas phase titrations to provide secondary documentation. Values presented in this report are based on NBKI results.

The NO_x analyzers were calibrated and audited by dilution of Standard Reference Material (SRM) cylinders of NO in nitrogen obtained from the National Bureau of Standards. The con-

verter efficiency was checked periodically by gas phase titration of NO with ozone. The results of external audit checks indicated that the converter efficiencies were greater than 96%. A commercial cylinder of NO in nitrogen, referenced to the SRM used for multi-point calibrations, was used as the source for daily span values.

The ozone and NO_x analyzers were multi-point calibrated prior to the initiation of valid data collection and again approximately 30 days after the initiation of the monitoring. After monitoring began, external audits were conducted on a weekly basis by both Radian and EPA personnel. For the external quality assurance audits, reagents, gases, glassware, calibration equipment, and personnel were all different than that involved in the multi-point calibration. In addition to the external audits, the instrument engineer responsible for the calibrations also performed random internal audits using the same equipment as that used for calibrations.

All instruments were automatically zeroed and spanned once each day by computer control. Each instrument was first switched to zero and a supply of zero air was introduced to the analyzers. The computer monitored the output of each channel and took a new zero reading after a stable zero signal had been reached. This zero reading was compared by the computer to the zero reading obtained 24 hours earlier. Next, span gas was supplied to each channel, and the computer decided when a stable span value had been reached. This value was recorded and compared to the previous day's value. The instruments were then returned to the monitor mode and after two minutes the computer resumed data taking. If either the zero or span value drifted by more than 10 ppb, it was noted and recorded as an excess drift. The operator could then check the system to see if a problem was developing. Excessive analyzer drift did not pose a problem in this study.

In addition to the above features, the quality assurance program for this study also included the following features:

1) The inside station temperature was continuously monitored to insure that the instruments had a stable environment. If the interior temperature became too high, a related feature included an automatic shutdown of the system to protect the components. Specific cases of temperature variations outside acceptable limits are given in Section 5.

2) Line voltage was continuously monitored to detect if there were any drops or surges that might affect instrument performance. No problems were encountered with line voltage during this study.

3) All flows were checked using either NBS-certified bubblemeters or mass flow controllers that had been referenced to NBS-certified bubblemeters.

4) The air sampling manifold was heated slightly to prevent water condensation. A high flow rate was maintained to minimize residence time. All system components were glass or Teflon.

5) A sensor was mounted in the sample line to signal the computer if the manifold fan malfunctioned. No malfunctions occurred.

6) The station was visited daily by trained personnel.

7) Detailed logbooks were maintained in each station.

8) A detailed checklist was completed daily at the station to assure proper operation of the system.

9) A hardcopy printout of all data (including automatic zero/spans) was provided hourly at each station. Data were checked daily for indications of problems.

10) The data acquisition system was totally automated to eliminate human errors in data.

11) The discrimination of the data acquisition system exceeded that of the analyzers.

12) The computer was equipped with automatic restart after power failures. The analyzers also restarted automatically. The time and duration of the power failure was recorded and printed on the hard copy.

13) Statistical significance of the data was assured by sampling all data channels once per second. Five-minute averages were calculated and stored.

14) The computer monitored and controlled many parts of the system. Problems were indicated visually by lights in the System Status Panel and by the hardcopy printout. All problem indications were also recorded on cassette tapes. Examples of monitored parameters include:

(a) excess zero drift
(b) excess span drift
(c) shelter temperature
(d) line voltage
(e) manifold fan operation
(f) manifold temperature
(g) instrument power

15) Data were recorded on two independent casette tapes and hardcopy.

The purpose of these quality assurance features was to produce and substantiate valid data. The primary means for validating data were the calibration and audit results. For ozone data to be considered acceptable, it had to be bracketed with a multi-point calibration and subsequent quality assurance audits with the audit results being within $\pm$ 15 percent of the control-sample value. For oxides of nitrogen data to be considered acceptable, audit results had to be within $\pm$ 20 percent of the control-sample value. These specific percentage values for valid data were established by EPA.

In addition to the audit results, decisions were also based upon the results contained in the daily checklists, station logs, and additional monitored parameters such as inside temperature and line voltage. EPA-approved instruments are to be operated in a 20°C-30°C (68°F-86°F) temperature range to meet

certification standards. In this study data were deleted if the inside station temperature varied outside these limits, although there may have been no apparent inaccuracies in the data.

4.0 SITE DESCRIPTION

The Shreveport site was located at the Shreveport Downtown Airport in the north part of the city. Figure 4-1 shows the relative location of the site.

The monitoring station was located on the west side of the airport next to a maintenance facility for small aircraft. The airport is located in a bend in the Red River such that the river forms a bound on all sides but the west. The distance from the station to the river was less than one mile. On the west side, the site bordered a business district containing commercial and light industrial facilities. Downtown Shreveport was about one and one-half miles south and southwest of the site. Farther south, beyond the downtown area, were some heavier industries. Street traffic was less than 150 feet west of the station. A power plant was located south of the site.

The monitoring station was well-located with respect to area influences, but the air flow around the station was somewhat biased. This location would affect only wind directions in the immediate vicinity, but should have no effect on area measurements of ozone and nitrogen oxides. The station measurements were representative of the concentrations of the pollutants in the Shreveport area. There was a hanger directly to the east that was ninety feet long, sixty feet wide, and forty feet tall. Another maintenance hangar was approximately one hundred feet south of the station. The areas to the west and north were open and unobstructed.

Air traffic at the airport was generally light as was the automobile traffic. At times, aircraft were tested in areas near the monitoring station and could have contributed to some NO_x levels. These contributions, however, were insignificant during this study.

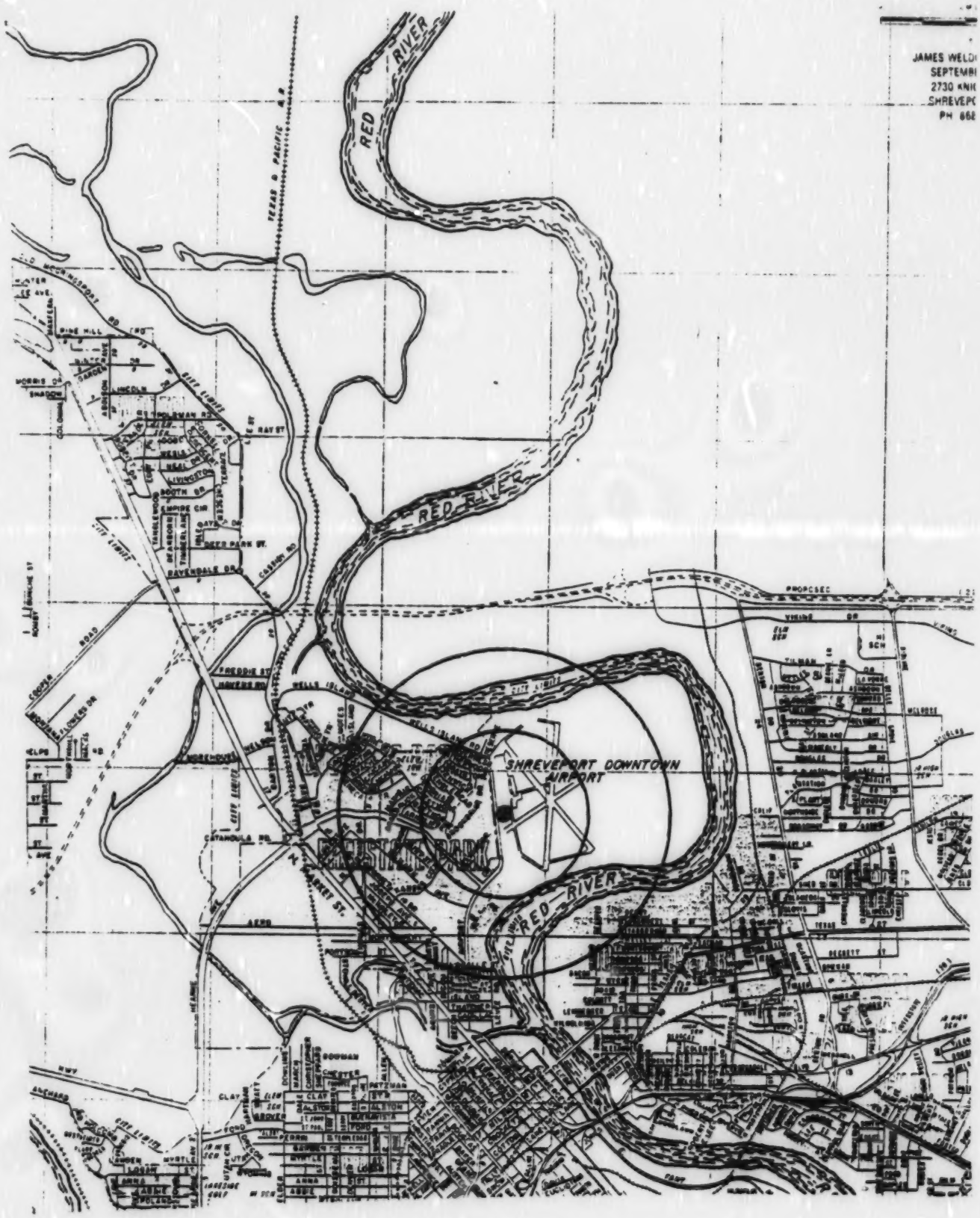

Figure 4-1. Location of Shreveport Site.

5.0 DATA PRESENTATION AND SUMMARY

This section includes summaries of the data for the Shreveport area. The data presentations indicate the variability of ozone and nitrogen oxides with respect to time.

All data channels were sampled once each second, and values recorded as five-minute arithematic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values. Inherent to any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for the NO_x analyzers and 2 ppb for the ozone analyzers. Therefore, any values appearing in the data presentations that are less than the threshold value indicate only a trace of the pollutant in question or random noise and should not be construed to be absolute levels. When the concentration levels drop below the lower threshold, the recorded quantity may be random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data were taken at the monitoring site in integer parts per billion (ppb) but are presented here in micrograms/cubic meter ($\mu g/m^3$) assuming reference temperature and pressure of 25°C and 760 mmHg (1013.2 millebars), respectively.

Radian monitoring station number 033 was delivered to the Shreveport site on July 6, 1977, but adequate power delayed the initiation of monitoring. After sufficient power was acquired, the station was activated and allowed to stabilize

before a multi-point calibration was performed at the site. After it was confirmed that the system was operating correctly, official monitoring began at midnight July 21, 1977 and continued through September 21, 1977 for sixty-three days of operation.

Tables 5-1 through 5-6 summarize the quality assurance results for the NO_x and ozone analyzers. The audit results for the site are divided into three classes: (1) EPA audits, (2) external Radian audits, and (3) internal Radian audits. This classification allows comparisons between auditing groups and techniques. The analyzers were operating within acceptable data limits during all audit checks. These results combined with the span data (Figures 5-1 through 5-3) indicate that the two analyzers were operating within the specified acceptable data limits for the duration of the monitoring program. No adjustments were made to either analyzer during the course of the program because at the time of the mid-term calibration on August 14, the analyzers were reading close enough to the true values that no additional accuracy could be gained by adjustments.

Some minor problems were noted in the daily zero spans for the NO_x analyzers, but these problems were caused by changes in the calibration source due to moisture in the calibrator and/or flow sensitivity. Inspection revealed that the analyzer was functioning correctly, but the span source had varied. This was verified by checking the system and re-spanning the analyzer.

Although the NO_x and ozone analyzers were operating correctly throughout the monitoring period, data were either lost or deleted as noted in the downtime presentation in Table 5-7. A discussion of these data losses is given below.

On July 30, the NO_x analyzer was off line for five hours. This instrument had been noisy, and preventive maintenance was deemed adviseable to prevent data loss. The instrument was checked with a calibration source before being taken off line to bracket the data. A light leak was discovered and repaired, and the flow rates were adjusted to increase sensitivity. The analyzer was next re-checked with the calibration source to verify that it was still operating within limits, and then it was returned to service.

All other downtime at Shreveport was due either to a malfunction in the data acquisition system or the interior temperature being out of limits.

For the period August 24 through August 29, there was an intermittent problem in the data system that was corrected by replacing a circuit board in the computer. Incomplete data was being recorded although all other parts of the system were operating correctly. Statistically significant data could not be obtained for August 26, 27 and 28 and therefore no averages were obtained. The time that the digitizing system was down also counted as downtime for the analyzers.

On August 5 and 6 the air conditioning system in the station malfunctioned and the interior station temperature rose above the limits (>86^{o}F) for acceptable data. The highest temperature recorded was 93^{o}F which was not high enough to automatically shut down the station. The air conditioner was repaired, and all data collected during the high temperature readings were deleted.

Data were also deleted during the validation process because the interior temperature fell below acceptable limits ($68^{\circ}F$). The time deleted can be obtained from Table 5-7 for the following days: September 3, 10, 14, 15, 16, 19, 20, 21. The temperature variations for these days were within $\pm 3^{\circ}F$, indicating that the analyzers were still in a stable environment. There also was no indication that the recorded levels for these times were incorrect, but the data were deleted for quality assurance purposes.

Valid data recovery for the Shreveport monitoring was 89.0% for the NO_x analyzer and 89.4% for the ozone analyzer.

Table 5-8 displays the average concentrations of the pollutants during the course of the monitoring program and for the month of August. Averages for the duration of the monitoring program rather than a series of monthly averages were computed because of the length of the monitoring assignment. August was the only calendar month for which monitoring was complete and a monthly average could be computed. It would not be statistically accurate to compute monthly averages for the portions of the other calendar months in which monitoring occurred.

The five largest one-hour concentrations are presented for each pollutant in Table 5-9. These values are based upon clock-hour averages and not independent sliding averages. The table gives the one-hour periods covered by the averages.

Tables 5-10 through 5-13 demonstrate the diurnal variation of each of the recorded pollutants. Figures 5-4, 5-5, 5-6, and 5-7 graphically represent the diurnal variations for August. Hourly averages were determined by arithmetically averaging five-minute samples. To insure statistical significance and to reduce

the possibility of introducing a bias in the presentation, averages were computed only when at least 50 percent of the samples were present. A blank entry indicates an insufficient number of five-minute samples present for that hour. The number of samples present for a particular channel is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time.

TABLE 5-1

EPA AUDIT RESULTS FOR NO AND NO_x CHANNELS

SHREVEPORT, LOUISIANA

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
7/26/77	0.353	0.398	0.407	+12.7	+15.3
	0.295	0.317	0.325	+ 7.5	+10.2
	0.177	0.188	0.186	+ 6.2	+ 5.1
	0.119	0.119	0.116	0	- 2.5
8/15/77	0.412	0.400	0.407	- 2.9	- 1.2
	0.254	0.243	0.249	- 4.3	- 2.0
	0.172	0.166	0.171	- 3.5	- 0.6
	0.106	0.102	0.105	- 3.8	- 0.9

TABLE 5-2
EPA AUDIT RESULTS FOR OZONE
SHREVEPORT, LOUISIANA

Date	Standard ppm	Indicated ppm	Percent Difference
7/26/77	0.336	0.348	+3.6
	0.246	0.257	+4.5
	0.155	0.167	+7.7
	0.110	0.123	+11.8
8/15/77	0.325	0.332	+2.9
	0.236	0.246	+4.2
	0.147	0.154	+4.8
	0.102	0.110	+7.8

TABLE 5-3

RADIAN EXTERNAL AUDITS ON NO_x AND NO CHANNELS

SHREVEPORT, LOUISIANA

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
7/26/77	0.332	0.388	0.386	+16.9	+16.3
	0.280	0.321	0.319	+14.6	+13.9
	0.212	0.248	0.240	+17.0	+13.2
	0.142	0.153	0.148	+ 7.7	+ 4.2
8/03/77	0.449	0.452	0.451	+ 0.7	+ 0.4
	0.394	0.396	0.397	+ 0.5	+ 0.8
	0.339	0.341	0.341	+ 0.6	+ 0.6
	0.287	0.289	0.288	+ 0.7	+ 0.4
	0.239	0.240	0.238	+ 0.4	- 0.4
	0.195	0.196	0.194	+ 0.5	- 0.5
9/01/77	0.362	0.333	0.333	- 8.0	- 8.0
	0.215	0.207	0.207	- 3.7	- 3.7
	0.178	0.176	0.176	- 1.1	- 1.1
	0.125	0.122	0.123	- 2.4	- 1.6
9/05/77	0.534	0.466	0.460	-12.7	-13.9
	0.416	0.375	0.371	- 9.9	-10.8
	0.364	0.338	0.324	- 7.1	-11.0
	0.221	0.208	0.206	- 5.9	- 6.8
9/14/77	0.534	0.495	0.485	- 7.3	- 9.2
	0.364	0.336	0.334	- 7.7	- 8.2
	0.221	0.199	0.199	-10.0	-10.0
9/21/77	0.358	0.355	0.345	- 0.8	- 3.6
	0.212	0.207	0.200	- 2.4	- 5.7
	0.169	0.167	0.163	- 1.2	- 3.6

TABLE 5-4
RADIAN EXTERNAL AUDITS ON OZONE
SHREVEPORT, LOUISIANA

Date	Standard ppm	Indicated ppm	Percent Difference
7/26/77	0.306	0.326	+ 6.5
	0.251	0.273	+ 8.8
	0.215	0.229	+ 6.5
	0.159	0.173	+10.7
8/03/77	0.410	0.408	- 0.5
	0.294	0.288	- 2.0
	0.170	0.168	- 1.2
8/12/77	0.405	0.398	- 1.7
	0.284	0.274	- 3.5
	0.158	0.156	- 1.3
9/01/77	0.408	0.412	+ 1.0
	0.140	0.145	+ 3.6
9/05/77	0.315	0.306	- 2.9
	0.264	0.254	- 3.8
	0.210	0.204	- 2.9
	0.164	0.155	- 5.5
9/14/77	0.315	0.318	+ 1.0
	0.264	0.270	+ 2.7
	0.210	0.216	+ 2.9
	0.164	0.168	+ 2.4
	0.102	0.108	+ 5.9
9/21/77	0.324	0.320	- 1.2
	0.264	0.271	+ 2.7
	0.220	0.219	- 0.5
	0.164	0.173	+ 5.5
	0.116	0.109	- 6.0

TABLE 5-5

RADIAN INTERNAL AUDITS ON NO_x AND NO CHANNELS

SHREVEPORT, LOUISIANA

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
7/19/77	0.383	0.413	0.410	+7.8	+7.1
	0.268	0.283	0.278	+5.6	+3.7
	0.170	0.175	0.172	+2.9	+1.2
	0.119	0.116	0.121	-2.5	+1.7
7/20/77	0.416	0.413	0.413	-0.7	0
	0.330	0.330	0.323	0	-2.1
	0.230	0.230	0.226	-1.3	-3.1
8/03/77	0.449	0.452	0.451	+0.7	+0.5
	0.394	0.396	0.397	+0.5	+0.8
	0.339	0.341	0.341	+0.6	+0.6
	0.287	0.289	0.288	+0.7	+0.4
	0.239	0.240	0.238	+0.4	-0.4
	0.195	0.196	0.194	+0.5	-0.5
8/14/77	0.443	0.434	0.434	-2.0	-2.0
	0.336	0.329	0.329	-2.1	-2.1
	0.284	0.279	0.277	-1.8	-2.5
	0.236	0.232	0.230	-1.6	-2.5
	0.193	0.188	0.186	-2.6	-3.6
8/25/77	0.440	0.416	0.416	-5.5	-5.5
	0.284	0.270	0.270	-4.9	-4.9
	0.190	0.180	0.181	-5.3	-4.7
	0.145	0.135	0.135	-6.9	-6.9
9/08/77	0.440	0.419	0.417	-4.8	-5.2
	0.284	0.269	0.269	-5.3	-5.6
	0.190	0.181	0.180	-4.7	-5.3
	0.145	0.138	0.136	-4.8	-6.2

TABLE 5-6
RADIAN INTERNAL AUDITS ON OZONE
SHREVEPORT, LOUISIANA

Date	Standard ppm	Indicated ppm	Percent Difference
7/20/77	0.305	0.305	0
	0.223	0.226	+1.4
	0.145	0.151	+4.1
8/03/77	0.410	0.408	-0.5
	0.294	0.288	-2.0
	0.170	0.168	-1.2
8/14/77	0.410	0.405	-1.2
	0.294	0.279	-5.1
	0.170	0.166	-2.4
8/25/77	0.410	0.411	-0.2
	0.284	0.278	-2.5
	0.170	0.165	-2.9
9/08/77	0.420	0.456	+8.6
	0.295	0.310	+5.1
	0.170	0.179	+5.3

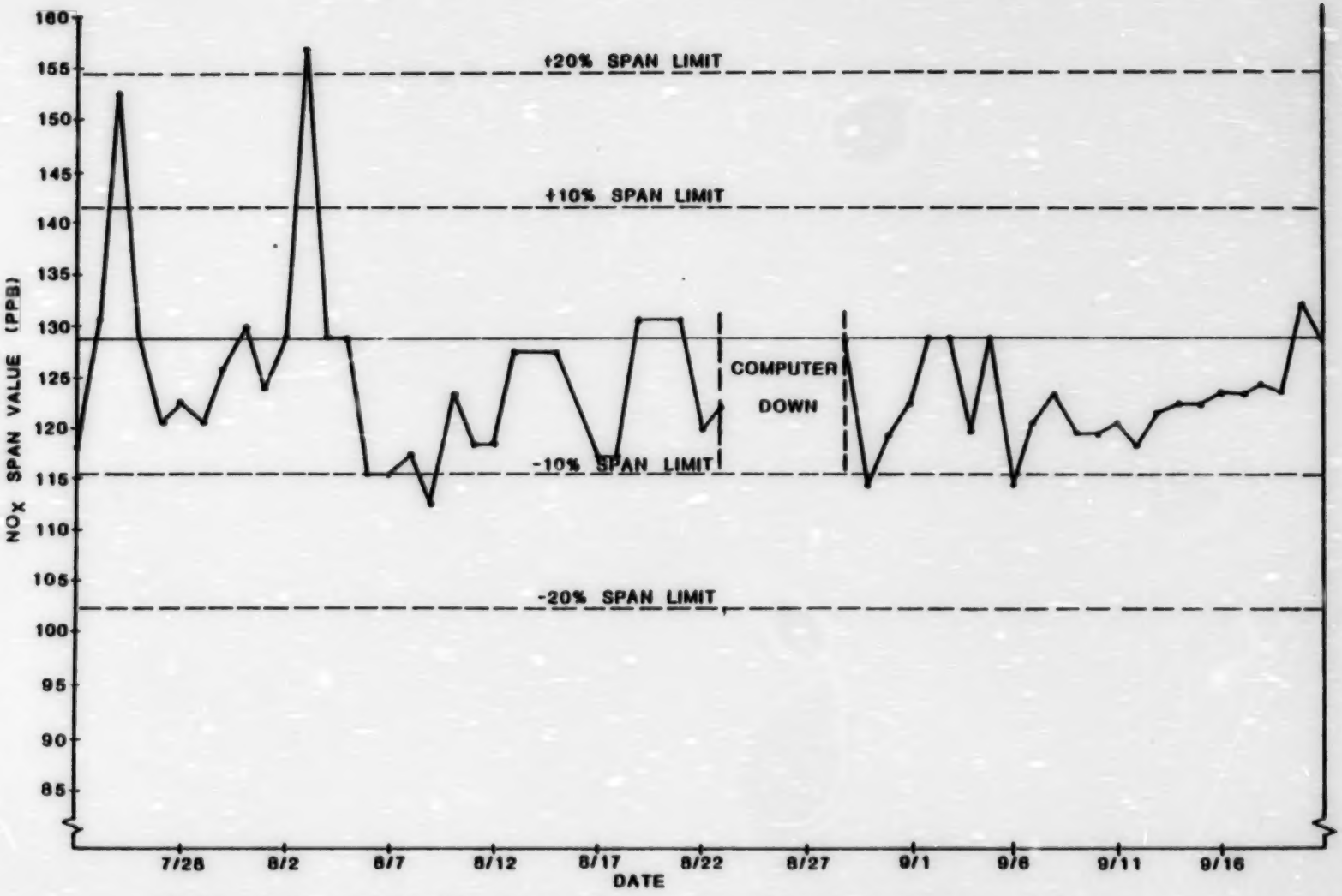

Figure 5-1. Daily NO_x Span Values, Shreveport, Louisiana

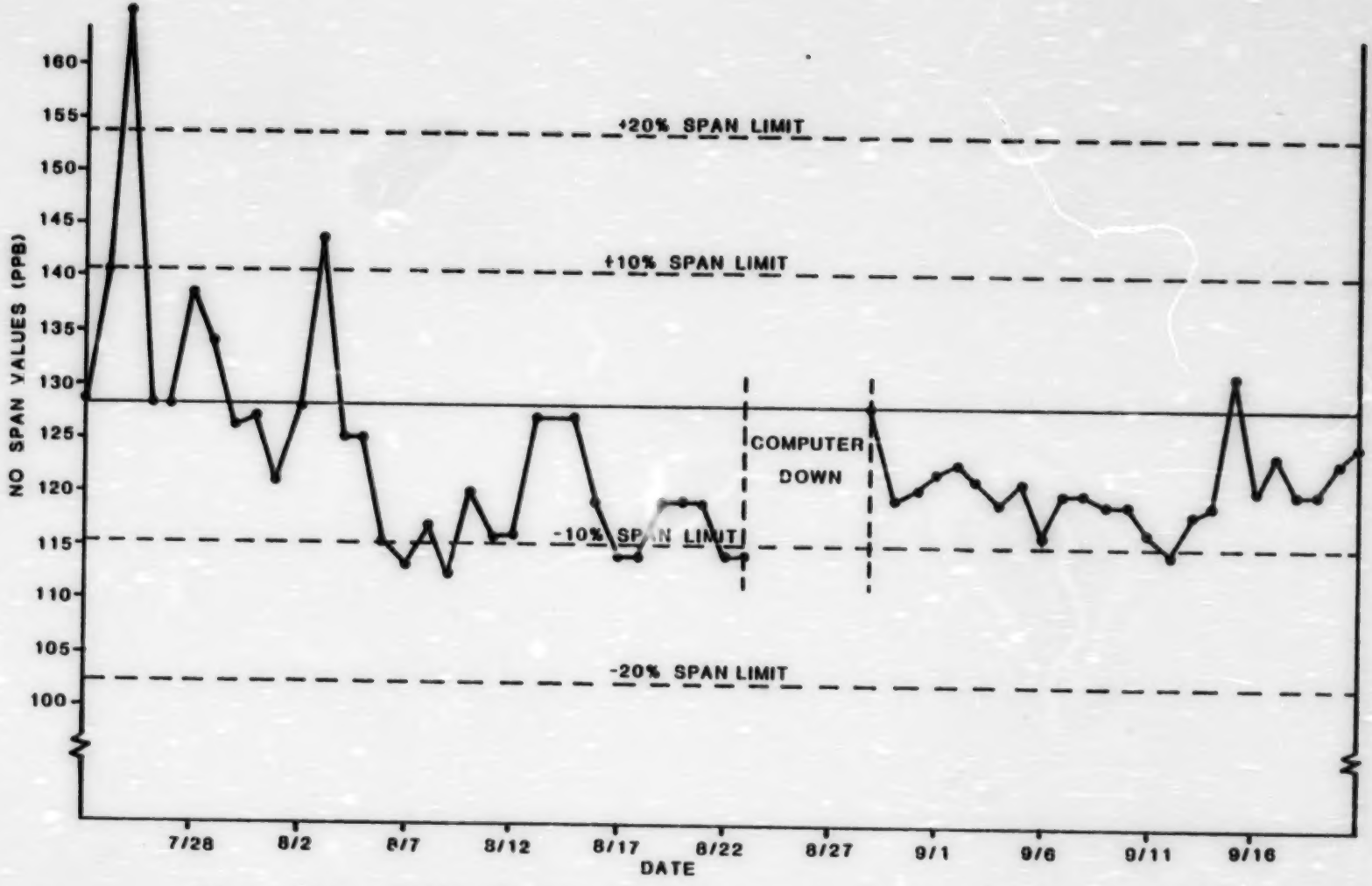

Figure 5-2. Daily NO Span Values, Shreveport, Louisiana

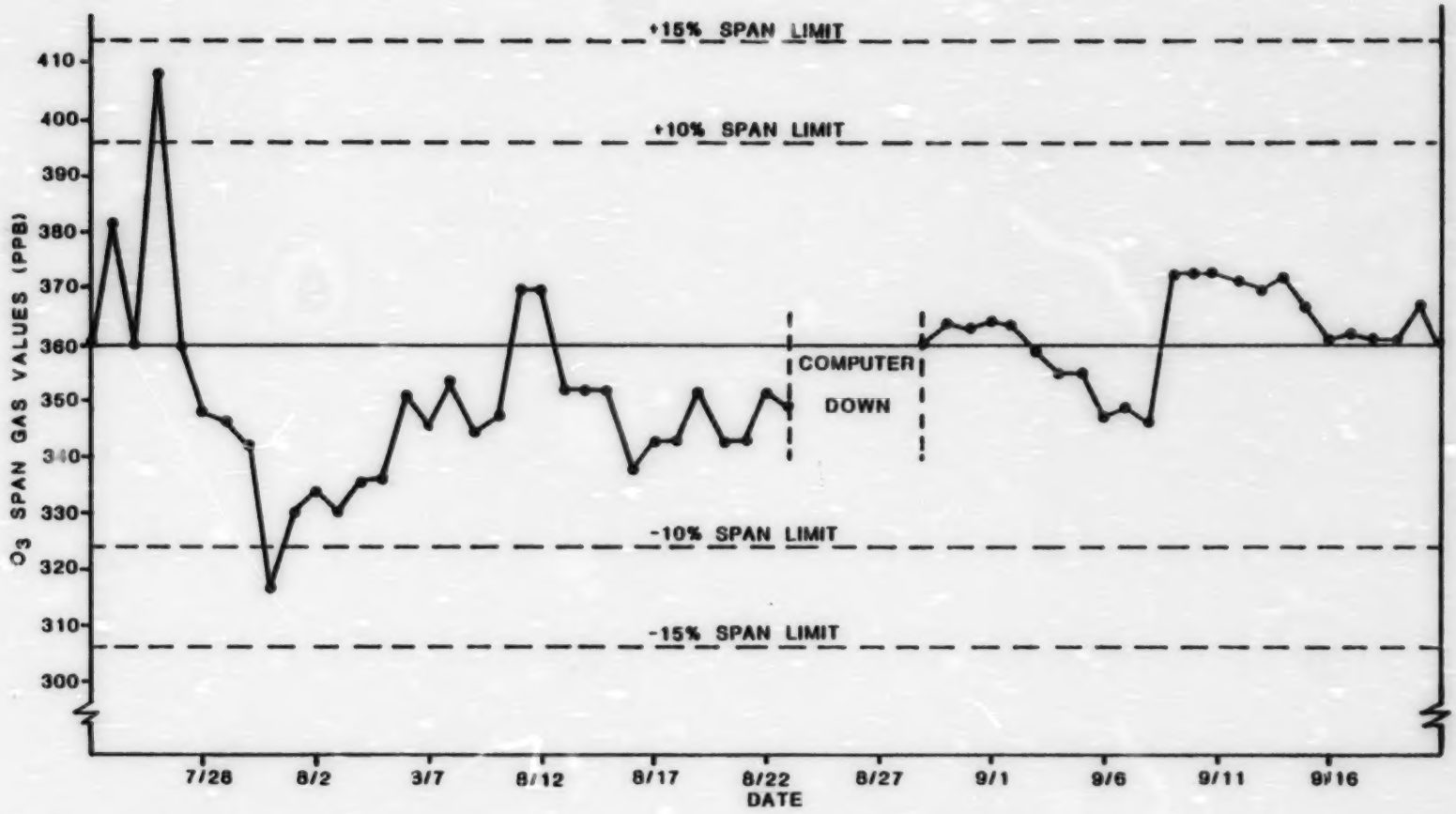

Figure 5-3. Daily Ozone Span Values, Shreveport, Louisiana

02-2266-1

TABLE 5-7

DOWNTIME FOR SHREVEPORT, LOUISIANA

Date	NO_x	NO	O_3
7/30/77	5	5	0
8/05/77	13	13	13
8/06/77	5	5	5
8/24/77	6	6	6
8/25/77	14	14	14
8/26/77	24	24	24
8/27/77	24	24	24
8/28/77	24	24	24
8/29/77	10	10	10
9/03/77	3	3	3
9/10/77	5	5	5
9/14/77	1	1	1
9/15/77	10	10	10
9/16/77	3	3	3
9/19/77	6	6	6
9/20/77	8	8	8
9/21/77	5	5	5
TOTAL	166	166	161

TABLE 5-8

PROGRAM AND MONTHLY AVERAGES

SHREVEPORT, LOUISIANA

Averaging Period	Nitrogen Oxides NO_x	Nitric Oxide NO	Nitrogen Dioxide NO_2	Ozone O_3
July 21 - Sept 21	10.0	1.6	8.3	73.6
Aug 1 - Aug 31	10.9	1.5	9.4	70.3

1.) All concentrations are expressed as micrograms per cubic meter ($\mu g/m^3$).

2.) The period from July 21 - September 21 constitutes the duration of the monitoring program at Shreveport.

TABLE 5-9

MAXIMUM ONE-HOUR AVERAGES FOR JULY 21 - SEPTEMBER 21

SHREVEPORT, LOUISIANA

(Concentrations: Micrograms per Cubic Meter)

Nitrogen Oxides		Nitric Oxide	
1.)	7/24/77 (1000-1100) - 217	1.)	8/23/77 (0800-0900) - 58
2.)	9/12/77 (0700-0800) - 94	2.)	9/12/77 (0700-0800) - 54
3.)	9/19/77 (2200-2300) - 94	3.)	8/22/77 (0800-0900) - 53
4.)	9/19/77 (2100-2200) - 86	4.)	9/19/77 (2200-2300) - 52
5.)	9/12/77 (0800-0900) - 81	5.)	8/22/77 (0700-0800) - 50

Nitrogen Dioxide		Ozone	
1.)	7/24/77 (1000-1100) - 217	1.)	7/23/77 (1200-1300) - 268
2.)	7/24/77 (2000-2100) - 79	2.)	7/23/77 (1300-1400) - 268
3.)	9/02/77 (2100-2200) - 66	3.)	7/23/77 (1100-1200) - 251
4.)	9/09/77 (2100-2200) - 66	4.)	7/27/77 (1300-1400) - 242
5.)	8/20/77 (2200-2300) - 65	5.)	7/23/77 (1400-1500) - 212

TABLE 5-10

DIURNAL VARIATION OF NITROGEN OXIDES (NO_x)

JULY 21 - SEPTEMBER 21

SHREVEPORT, LOUISIANA

DIURNAL VARIATION OF NITROGEN OXIDES (UG/M**3)

TRAILER NO. - 33 PERIOD (7/21/77 TO 7/31/77)

	HOUR																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
21	14	11	15	:	2	1	6	30	11	11	7	0	0	1	0	0	2	0	0	0	3	0	0	0	5
22	0	0	0	0:	0	0	5	20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
23	0	5	8	23:	15	6	7	4	51	32	17	4	0	0	0	0	0	0	0	0	4	0	0	0	7
24	9	3	13	6:	3	0	3	9	0	0	217	:	:	0	0	0	0	23	21	19	79	33	14	14	21
25	1	0	0	0:	0	0	6	22	17	3	2	0	1	0	1	1	0	3	0	0	0	2	6	10	3
26	10	4	3	0:	0	0:	1	23	:	:	:	:	:	:	:	0	0	0	0	0	0	1	0	0	2
27	0	0	0	0:	1	0	0	0	1	9	6	3	10	8	1	3	15	58	31	30	13	7	0	0	8
28	0	2	0	0:	0	0	0	15	27	30	30	44	33	18	21	7	0	3	0	0	1	6	7	12	11
29	23	13	11	6:	3	1	11	34	33	12	8	13	6	0	0	0	0	0	0	0	7	3	11	6	8
30	0	2	5	1:	10	10	6	2	10	21	16	14:	:						:	:	60	38	33	41	17
31	44	34	34	39:	21	25	31	42	22	22:	:	2	1	1	0	0	0	0	0	1	8	15	0	4	14
MEAN	9	7	8	8	5	4	7	18	17	14	34	9	6	3	2	1	2	9	5	5	16	9	6	8	

TOTAL NUMBER OF OBSERVATIONS = 2874. MEAN = 9.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN OXIDES (UG/M**3)

TRAILER NO. - 33 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	3	0	0	0:	0	0	0	0	0	0	25	12	:	0	0	0	0	0	0	0	0	0	3	37	3
2	53	30	24	0:	0	0	0	0	0	0	0	0:	0	0	0	0	:	:	:	5:	1	1	0	0	5
3	0	0	0	3:	4	2	5	20	44	72	33	4:	:	0:	0	0	0	0	0	4:	:	8:	26	52	13
4	40	33	27	23:	22	22	29	23	69	:	15	4	0	0	0	0	0	0	0	4	13	6	4	3	15
5		0	1	0:	0	0	0	2	4	3	17	22													4
6		2	1	1:	3	0	5	6	10	9					0:	6	20	6	5:	46:	64	41	30	10	14
7	18	19	18	12:	11	4	3	8	15	27	10	0	0:	0	0	0	0	0	0	0	23	37	12	8	10
8	13	12	7	1:	11	17	37	72	38	20	15	:	5:	1	0	0	0	0	0	2	22	23	20	12	14
9	2	0	3	2:	9	9	20	66	43	6	3	3:	7:	1	0	3	4	0	0	6	37	42	5	6	12
10	4	6	7	3:	0	5	13	46	49	2	3	0	0	:	6:	0	0	0	0	1	6	14	19	7	8
11	10	9	5	4:	2	6	16	27	20	11	3	1	:	0	0	0	0	0	0	0	3	0	0	0	5
12	0	0	0	0:	0	0	7	9	6	17	7	1	0	0	0:	:	0	1	0	0	2	7	12	10	3
13	6	2	2	0:	1	0	3	1	1	2	0	0:	12:	1	5	27	38	9	4	9	11	12	27	33	9
14	27	14	13	19:	14	7	9	7	10	11	9	5:	:	:	40:	15	9	19	12	15	19	26	28	38	17
15	34	33	16	14:	23	19	38	69	50	27	13	10	:	:	:	11:	12	14	12	16	30	28	11	15	24
16	18	18	12	6:	9	23	37	73	36	21	16	12	10	11	9	12	12	13	13	18	26	32:	:	15	20
17	18	8	7	6:	4	6	11	31	23	12	2	0	0	3:	0	1	9	18	29	29	15	4	24	10	11
18	7	8	11	2:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	10	7	2
19	0	0	0	0:	0	0	0	3	4	6	22	8	0	0	0	0	0	0	0	0	0	0	0	0	2
20	0	0	0	0:	0	0	0	6	12	8	3	5:	32:	11	6	4	8	10	20	11	11	21	72	62	12
21	34	24	26	26:	15	7	8	8	15	12	15	8	12	5	6	57	50	22	11	22	20	18	60	39	22
22	18	12	22	23:	19	24	44	74	78	65	19	23	7	2	2	1	5	11	4	:	19	20	14	11	23
23	8	8	4	3:	2	4	21	36	76	25	50	44	15	15	11	9	5	0	2	4:	6:	7	8	7	16
24	8	5	2	4:	3	6	6	24	27	12	7	4	0	1	0	2	4							10	7
25								30	46					9	:	:	:	:	0	5					19
26																									
27																									
28																									
29											0	0	0	0	0	0	0	0	0	0	0:	7	9	2	1
30	0	0	1	0:	0	0	0	0	0	7:	:	0	0	0	0	0	0	0	0	0	0		0	1	0
31	1	2	7	5:	0	0	0	9	22	4	0:	0:	0	0	0	0	0	0	0	2	9	1	3		3
MEAN	13	9	8	6	6	6	12	24	26	15	12	7	4	2	3	6	7	5	4	7	14	15	17	16	

TOTAL NUMBER OF OBSERVATIONS = 7027. MEAN = 11.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN OXIDES (UG/M**3)

TRAILER NO. - 33 PERIOD (9/1/77 TO 9/21/77)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	1	1	6	:	1	0	0	0	6	10	0:	:	:	0:	0	0	0	1	0	1	14	22	31	22	6
2	13	9	12	:	21:	26	21	14	23	15	4	0	0	0	0	0	0	0	3	17	51	79	52	69	19
3	31	24	25	:	7				1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4
4	1	0	0	1:	3	5	5	4	6	4	0	0	0	0	0	0	0	0	0	1	7	12	7	5	2
5	7	3	2	0:	0	0	0	0	0	0	0:	:	:	:	0	0	0	0	1	0	0	0	0	0	0
6	0	0	0	0:	0	0	0	4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0:	0	0	3	0	0	0	0	0	0	0	1	0	2	29	9	47	34	18	11	11	7
8	6	14	7	3:	4	4	12	38	9	9	1:	:	6:	6:	13:	4:	1	2	4	16	45	38	51	52	16
9	44	17	2	38:	15	5	4	0	3	0	0	0	0	0	0	0	0	12	28	30	50	80	28	6	15
10	3	0	3	2:	7						3	0	0	0	0	0	0	0	0	13	37	6	5	13	5
11	0	29	43	37:	18	14	2	1	4	0	0	0	0	0	0	0	0	0	0	4	16	20	7	3	7
12	5	0	0	0:	2	0	8	94	81	36	5	2	3	0	1	0	0	0	0	0	11	10	2	0	11
13	0	0	0	0:	0	0	0	9	9	4	2	0	0	0	0	0	0	1	0	0	0	1	0	2	1
14	0	0	0	0:	0	0	0	1	:	:	:	1	1	0	0	0	0	1	1	15	30	20	16		4
15				:							27	5	0	0	0	0	0	0	0	8	36	17	3	0	7
16	0	0	0	:				0	5	0	0	0	0	0	0	0	0	0	0	6	17	17	11	5	3
17	0	0	0	:	0	0	0							0	0	0	0	0	0	0	2	4	6	5	1
18	0	0	0	:	0	1	0	3	1	0	0	0	0	0	0	0	0	0	0	6	22	12	1	0	2
19	0	0	0	0:	0	0	0	0	6	69	30	14	2	8	6	2	3	1	1	13	22	86	94	56	17
20	60	45		:							0	0	0	0	0	0	0	0	0	0	10	23	49	48	14
21	24	15	7	:						10	16		:	:	0:	0	0	0	0	0	9	22	15	31	34	12
MEAN	10	8	5	6	4	3	4	11	10	10	5	1	0	0	1	0	0	2	2	9	20	23	19	16	

TOTAL NUMBER OF OBSERVATIONS = 5221. MEAN = 8.

: INDICATES CALIBRATION DURING THE HOUR

TABLE 5-11

DIURNAL VARIATION OF NITRIC OXIDE (NO)

JULY 21 - SEPTEMBER 21

SHREVEPORT, LOUISIANA

DIURNAL VARIATION OF NITRIC OXIDE (UG/M**3)

TRAILER NO. - 33 PERIOD (7/21/77 TO 7/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
21	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0:	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0:	0	0	0	0	0	0	0	:	:	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0:	0	0	:	:	:	:	:	:	:	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	0	0	0	0:	:						:	:	1	0	0	1	0
31	2	8	15	21:	21	20	22	22	22	22:	:	2	1	1	0	0	0	0	0	1	0	0	0	0	7
MEAN	0	0	1	2	1	1	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TOTAL NUMBER OF OBSERVATIONS = 2874. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITRIC OXIDE (UG/M**3)

TRAILER NO. - 33 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	0	0	0	0:	0	0	0	0	0	0	7	4	:	0	0	0	0	0	0	0	0	0	0	0	0
2	2	0	0	0:	0	0	0	0	0	0	0	0:	0	0	0	0	:	:	:	2:	0	0	0	0	0
3	0	0	0	0:	0	0	0	1	5	10	0	0:	:	0:	0	0	0	0	0	0:	:	0:	0	0	0
4	0	0	0	0:	0	0	0	0	10	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5		0	0	0:	0	0	0	0	0	0	0	0													0
6		0	0	0:	0	0	0	0	0	0					0:	0	0	0	0:	0:	10	0	0	0	0
7	0	0	0	0:	0	0	0	0	2	6	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0:	0	0	5	33	15	4	3	:	0:	0	0	0	0	0	0	0	0	0	0	0	2
9	0	0	0	0:	0	0	0	22	18	1	0	0:	4:	0	0	0	0	0	0	0	0	0	0	0	2
10	0	0	0	0:	0	0	0	25	27	2	3	0	0	:	0:	0	0	0	0	0	0	0	0	0	2
11	0	0	0	0:	0	0	0	0	0	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0:	:	0	0	0	0	0	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0:	6:	0	0	4	6	0	0	0	0	0	0	0	0
14	0	0	0	0:	0	0	0	0	0	0	0	0:	:	:	4:	1	0	1	0	0	0	0	1	4	0
15	2	1	0	0:	0	0	13	40	26	11	1	0	:	:	:	0:	0	0	0	0	0	0	0	0	4
16	0	0	0	0:	0	0	2	36	13	6	2	1	13	0	0	0	0	1	0	0	0	0:	:	0	3
17	0	0	0	0:	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0:	0	0	0	0	0	0	0	0:	2:	0	0	0	0	0	1	0	0	0	7	8	0
21	0	0	0	0:	0	0	0	0	0	0	2	1	1	1	0	19	9	0	0	0	0	0	27	6	3
22	0	1	2	3:	1	7	24	50	53	31	3	6	0	0	0	0	0	0	0	:	0	0	0	0	8
23	0	0	0	0:	0	0	5	19	58	10	16	15	1	0	0	0	0	0	0	0:	0:	0	0	0	5
24	0	0	0	0:	0	0	0	7	9	1	0	0	0	0	0	0	0							0	1
25								6	20					3	:	:	:	:	0	0					6
26																									
27																									
28																									
29											0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0
30	0	0	0	0:	0	0	0	0	0	0:	:	0	0	0	0	0	0	0	0	0	0		0	0	0
31	0	0	0	0:	0	0	0	0	5	0	0:	0:	0	0	0	0	0	0	0	0	0	0	0		0
MEAN	0	0	0	0	0	0	2	9	9	3	1	1	1	0	0	1	0	0	0	0	0	0	1	0	

TOTAL NUMBER OF OBSERVATIONS = 7028. MEAN = 2.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITRIC OXIDE (UG/M**3)

TRAILER NO. - 33 PERIOD (9/1/77 TO 9/21/77)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	0	0	0	:	0	0	0	0	1	2	0:	:	:	0:	0	0	0	0	0	0	0	0	0	1	0
2	0	0	0	:	0:	1	1	2	5	1	0	0	0	0	0	0	0	0	0	0	0	13	7	19	2
3	3	3	0	:	1				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0:	0	0	0	0	0	0	0:	:	:	:	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0:	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0:	0	0	2	20	0	0	0:	:	0:	0:	0:	0:	0	0	0	0	0	0	5	8	1
9	3	0	0	8:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0
10	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
11	0	8	11	7:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12	0	0	0	0:	0	0	0	54	42	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
13	0	0	0	0:	0	0	0	4	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0:	0	0	0	0	:	:	:	0	0	0	0	0	0	0	0	1	7	2	3		0
15				:							1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	:				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	:	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0:	0	0	0	0	1	19	2	0	0	0	0	0	0	0	0	0	6	40	52	25	6
20	32	25		:							0	0	0	0	0	0	0	0	0	0	2	11	1	1	4
21	0	0	0	:						0	0	:	:	0:	0	0	0	0	0	0	0	0	0	0	0
MEAN	2	1	0	1	0	0	0	5	3	2	0	0	0	0	0	0	0	0	0	0	0	3	3	2	

TOTA NUMBER OF OBSERVATIONS = 5221. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

TABLE 5-12

DIURNAL VARIATION OF NITROGEN DIOXIDE (NO_2)

JULY 21 - SEPTEMBER 21

SHREVEPORT, LOUISIANA

DIURNAL VARIATION OF NITROGEN DIOXIDE (UG/M**3)

TRAILER NO. - 33 PERIOD (7/21/77 TO 7/31/77)

	HOUR																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
21	14	11	15	:	2	1	6	30	11	11	7	0	0	1	0	0	2	0	0	0	3	0	0	0	5
22	0	0	0	0:	0	0	5	20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
23	0	5	8	23:	15	6	7	4	48	32	17	4	0	0	0	0	0	0	0	0	4	0	0	0	7
24	9	3	13	6:	3	0	3	9	0	0	217	:	:	0	0	0	0	23	21	19	79	33	14	14	21
25	1	0	0	0:	0	0	6	22	17	3	2	0	1	0	1	1	0	3	0	0	0	2	6	10	3
26	10	4	3	0:	0	0:	1	23	:	:	:	:	:	:	:	0	0	0	0	0	0	1	0	0	2
27	0	0	0	0:	1	0	0	0	1	9	6	3	10	8	1	3	15	58	31	30	13	7	0	0	8
28	0	2	0	0:	0	0	0	15	27	30	30	44	33	18	21	7	0	3	0	0	1	6	7	12	11
29	23	13	11	6:	3	1	11	34	33	12	8	13	6	0	0	0	0	0	0	0	7	3	11	6	8
30	0	2	5	1:	10	10	6	2	10	21	16	14:	:						:	:	58	38	33	40	17
31	42	25	19	17:	0	4	8	19	0	0:	:	0	0	0	0	0	0	0	0	0	8	15	0	4	7
MEAN	9	6	7	6	3	2	5	16	15	12	34	8	6	3	2	1	2	9	5	5	16	9	6	8	

TOTAL NUMBER OF OBSERVATIONS = 2874. MEAN = 8.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN DIOXIDE (UG/M**3)

TRAILER NO. - 33 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	3	0	0	0:	0	0	0	0	0	0	18	7	:	0	0	0	0	0	0	0	0	0	3	37	3
2	50	30	24	0:	0	0	0	0	0	0	0	0:	0	0	0	0	:	:	:	2:	1	1	0	0	5
3	0	0	0	3:	4	2	5	19	38	62	33	4:	:	0:	0	0	0	0	0	4:	:	8:	26	52	12
4	40	33	27	23:	22	22	29	23	58	:	15	4	0	0	0	0	0	0	0	4	13	6	4	3	14
5		0	1	0:	0	0	0	2	4	3	17	22													4
6		2	1	1:	3	0	5	6	10	9					0:	6	19	6	5:	46:	54	41	30	10	13
7	18	19	18	12:	11	4	3	8	13	21	10	0	0:	0	0	0	0	0	0	0	23	37	12	8	9
8	13	12	7	1:	11	17	32	39	23	16	11	:	5:	1	0	0	0	0	0	2	22	23	20	12	12
9	2	0	3	2:	9	9	19	43	25	5	3	3:	3:	1	0	3	4	0	0	6	37	41	5	6	10
10	4	6	7	3:	0	5	12	20	22	0	0	0	0	:	5:	0	0	0	0	1	6	14	19	7	6
11	10	9	5	4:	2	6	16	27	20	11	3	1	:	0	0	0	0	0	0	0	3	0	0	0	5
12	0	0	0	0:	0	0	7	9	6	17	7	1	0	0	0:	:	0	1	0	0	2	7	12	10	3
13	6	2	2	0:	1	0	3	1	1	2	0	0:	6:	1	5	23	31	9	4	9	11	12	27	33	8
14	27	14	13	19:	14	7	9	7	10	11	9	5:	:	:	36:	14	8	18	12	15	19	26	27	33	16
15	32	31	16	14:	23	18	25	28	24	15	11	9	:	:	:	11:	11	14	11	16	30	28	11	15	19
16	18	17	12	6:	9	23	35	36	22	14	12	11	9	10	9	12	12	12	13	18	26	32:	:	15	17
17	18	8	7	6:	4	6	11	31	23	12	2	0	0	3:	0	1	9	18	29	29	15	4	24	10	11
18	7	8	11	2:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	10	7	2
19	0	0	0	0:	0	0	0	3	4	6	22	8	0	0	0	0	0	0	0	0	0	0	0	0	2
20	0	0	0	0:	0	0	0	6	12	8	3	5:	30:	11	6	4	8	10	19	11	11	21	65	53	11
21	34	24	26	26:	15	7	8	8	14	12	13	6	11	3	5	38	41	21	10	21	20	17	33	33	19
22	18	11	20	20:	18	17	19	24	25	34	16	17	6	2	2	1	5	11	4	:	19	20	14	11	15
23	8	8	4	3:	2	4	15	17	19	14	34	29	14	15	11	9	5	0	2	4:	6:	7	8	7	10
24	8	5	2	4:	3	6	6	17	17	11	7	4	0	1	0	2	4							10	6
25								24	26					6	:	:	:	:	0	5					13
26																									
27																									
28																									
29											0	0	0	0	0	0	0	0	0	0	0:	7	9	2	1
30	0	0	1	0:	0	0	0	0	0	7:	:	0	0	0	0	0	0	0	0	0	0		0	1	0
31	1	2	7	5:	0	0	0	9	16	3	0:	0:	0	0	0	0	0	0	0	2	9	1	3		2
MEAN	13	9	8	6	6	6	10	15	16	12	10	6	4	2	3	5	6	5	4	7	14	15	15	15	

TOTAL NUMBER OF OBSERVATIONS = 7027. MEAN = 9.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN DIOXIDE (UG/M**3)

TRAILER NO. - 33 PERIOD (9/1/77 TO 9/21/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	1	1	6	:	1	0	0	0	4	7	0:	:	:	0:	0	0	0	1	0	1	14	22	31	21	5
2	13	9	11	:	21:	25	20	12	18	14	4	0	0	0	0	0	0	0	3	17	51	66	45	50	16
3	27	21	24	:	6				1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4
4	1	0	0	1:	3	5	5	4	6	4	0	0	0	0	0	0	0	0	0	1	7	12	7	5	2
5	7	2	2	0:	0	0	0	0	0	0	0:	:	:	:	0	0	0	0	1	0	0	0	0	0	0
6	0	0	0	0	0	0	0	3	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0:	0	0	1	0	0	0	0	0	0	0	1	0	2	28	9	46	34	18	11	11	7
8	6	14	7	3:	4	4	10	18	9	9	1:	:	6:	6:	13:	4:	1	2	4	16	45	37	46	43	14
9	41	17	2	29:	15	5	4	0	3	0	0	0	0	0	0	0	0	12	28	30	49	66	28	6	14
10	3	0	3	2	7						3	0	0	0	0	0	0	0	0	13	35	6	5	13	5
11	0	20	32	29:	18	14	2	1	4	0	0	0	0	0	0	0	0	0	0	4	16	20	7	3	6
12	5	0	0	0:	2	0	8	39	39	30	5	2	3	0	1	0	0	0	0	0	11	10	2	0	7
13	0	0	0	0:	0	0	0	5	5	2	1	0	0	0	0	0	0	1	0	0	0	1	0	2	1
14	0	0	0	0:	0	0	0	1	:	:	:	1	1	0	0	0	0	0	1	14	23	17	13		4
15				:							25	5	0	0	0	0	0	0	0	8	36	17	3	0	6
16	0	0	0	:				0	5	0	0	0	0	0	0	0	0	0	0	6	17	17	11	5	3
17	0	0	0	:	0	0	0							0	0	0	0	0	0	0	2	4	6	5	1
18	0	0	0	:	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	6	22	12	1	0	2
19	0	0	0	0:	0	0	0	0	5	50	28	14	2	8	6	2	3	1	1	13	15	45	41	30	11
20	27	19		:							0	0	0	0	0	0	0	0	0	0	7	11	48	46	10
21	24	15	7	:						10	16	:	:	0:	0	0	0	0	0	9	22	15	31	34	12
MEAN	8	6	5	4	4	3	3	6	7	8	4	1	0	0	1	0	0	2	2	9	19	19	16	14	

TOTAL NUMBER OF OBSERVATIONS = 5221. MEAN = 7.

: INDICATES CALIBRATION DURING THE HOUR

TABLE 5-13

DIURNAL VARIATION OF OZONE

JULY 21 - SEPTEMBER 21

SHREVEPORT, LOUISIANA

DIURNAL VARIATION OF OZONE (UG/M**3)

TRAILER NO. - 33 PERIOD (7/21/77 TO 7/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
21	49	53	39	:	20	21	17	8	14	23	43	76	101	134	104	101	97	95	93	86	74	92	54	48	63
22	46	44	37	:	61	78	54	49	74	93	126	159	185	124	135	149	148	160	178	171	111	108	113	100	109
23	91	61	42	31:	29	22	18	22	26	77	163	251	268	268	212	199	209	194	192	167	149	97	72	62	124
24	58	56	43	57:	49	65	59	59	81	99	135	149		:201	200	192	163	109	75	61	14	41	43	59	90
25	54	74	97		:106	88	63	42	48	59	98	132	157	184	195	195	194	155	135	142	122	100	98	:116	116
26	110	111	103	64:	90	102:		:	79	71	:	:	:176:		:	184	190	180	176	177	160	136	116	133	131
27	134	121	107		: 71	65	51	43	55	67	112	138	192	242	214	141	111	60	79	73	65	62	58	60	101
28	51	47	58		: 59	58	33	21	20	42	64	81	116	135	141	163	172	188	162	122	93	86	72	67	89
29	57	65	60		: 90	89	76	55	64	86	85	76	98	116	122	140	148	143	145	118	94	97	82	91	96
30	95	108	96		: 87	71	48	92	93	61	61	57	69	92	99	105	75	53	52	42	22	21	16	7	66
31	6	36	53	58:	68	55	35	23	48	66	77:	99	102	92	98	139	169	138	97	71	33	15	33	18	68
Mean	68	71	67	55	66	65	45	45	54	67	97	121	146	159	152	155	152	134	126	112	85	78	67	69	

TOTAL NUMBER OF OBSERVATIONS = 2964. MEAN = 95.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF OZONE (UG/M**3)

TRAILER NO. - 33 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	14	28	36	30:	100	119	124	120	107	85	47	87	109	121	140	142	138	124	117	117	94	65	43	8	89
2	4	5	5	19:	18	21	19	32	65	104	114	124	141	148	144	129	126	127	123	123	97	83	85	73	82
3	63	53	41	29:	33	40	31	25	42	76	137	166	144	148:	153	150	156	163	150	129	:	:	53:	25	92
4	24	48	47	45:	60	49	19	23	30	:164	183	174	201	197	187	204	183	177	160	121	110	118	102		114
5		96	85	89:	91	80	59	44	35	42	43	63													66
6		36	23	23:	14	8	2	2	14	48					110:	92	77	102	65:	13:	4	9	23	37	36
7	31	30	31	32:	28	31	26	21	30	50	72	87	99:	108	101	93	90	87	88	79	38	22	59	69	58
8	67	62	60	62:	40	28	9	8	34	60	86		:139:	113	112	115	109	107	97	84	44	44	47	56	69
9	81	89	73	67:	54	48	34	12	35	62	81	90:	96:	108	111	108	125	132	121	101	57	29	69	65	76
10	63	58	54	43:	41	27	14	10	27	62	74	91	156		:163:	143	143	148	125	116	99	81	70	82	82
11	78	78	85	84:	80	65	44	28	48	72	98	121		:127	124	112	120	107	105	92	70	75	75	85	86
12	76	66	62	58:	52	41	26	27	41	38:	:	85:		:113:		:139:	127	115	110	93	82	69	53	42	71
13	42	39	36	40:	31	23	18	25	33	40	54	65:	79:	92	87	61	60	95	87	68	48	37	15	5	48
14	11	16	11	0:	1	11	9	13	24	38	63	76	63	75		:118	128	137	99	65	42	16	6	0	44
15	3	0	12	15:	11	12	2	0	11	:	:		:100:	144	118	93	91	100	92	79	52	27	39	37	48
16	35	30	35	30:	23	7	0	0	18	33	57	74	100	112	118	121	115	106	102	76	62	42:	:	39	58
17	33	51	80	73:	70	54	40	23	38	49	85	121	145	137:	154	177	173	149	157	139	110	80	37	53	92
18	67	70	61	52:	49	35	35	59	58	55	54	42	53	68	80	95	109	111	105	103	81	62	63	46	67
19	54	63	86	88:	86	76	78	81	82	100	116	164	175	168	171	171	159	152	148	124	125	119	109	110	117
20	107	109	112	108:	105	99	93	86	91	112	128	129:	114:	143	173	164	132	118	75	69	62	36	1	0	98
21	10	23	15	9:	15	29	27	19	25	27	28	28	36	52	54	22	24	24	45	31	19	14	1	0	24
22	3	7	0	1:	0	0	0	0	4	28	53	35	77	103	110	126	132	115	102	:	43	31	25	23	44
23	27	19	14	13:	16	10	0	0	0	22	22	30	77	142	157	115	106	95	83	68:	47:	37	27	25	48
24	29	40	34	29:	22	13	7	2	7	20	41	86	131	154	149	180	206							38	66
25								5	6					126	118	139	133	124	121	104					95
26																									
27																									
28																									
29											48	70	122	110	116	106	101	102	112	41	18:	60	49	52	82
30	49	36	21	25:	34	23	20	17	27	42:	:	96	97	103	108	112	108	97	85	78	79		71	55	63
31	36	22	10	10:	18	17	10	7	17	49	70:	77:	75	77	82	81	82	81	81	65	40:	58	53		48
Mean	42	45	44	42	42	37	29	25	35	55	76	92	110	119	126	122	121	115	107	90	65	52	49	45	

TOTAL NUMBER OF OBSERVATIONS = 7112. MEAN = 70.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF OZONE (UG/M**3)

TRAILER NO. - 33 PERIOD (9/1/77 TO 9/22/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	46	32	18	:	12	17	15	14	27	45	69:	:	8:	57:	93	103	96	80	94	79	51	34	16	18	47
2	26	19	21	:	5:	1	4	11	25	60	94	108	109	104	103	110	111	107	104	80	31	12	19	6	55
3	17	18	13	:	20				56	90	123	147	162	155	161	164	175	176	160	135	111	118	113	90	109
4	86	85	80	78:	74	65	64	63	72	90	98	99	124	129	113	110	99	99	90	81	67	58	59	52	85
5	45	51	51	46:	36	32	30	28	41	56	73:	:	77:	75	76	79	79	79	70	69	65	61	49	46	57
6	54	48	52	45	38	30	23	17	30	47	58	62:	76:	81	75	73	70	78	77	75	77	76	69	66	58
7	56	48	41	40:	31	33	29	32	39	59	88	101	115	134	111	125	109	62	66	21	15	37	43	32	61
8	24	15	17	23:	28	26	17	5	20	46	100	141	145	:	:	128:	117	101	91	74	21	21	12	6	53
9	9	14	24	2:	7	29	28	31	34	67	93	131	158	188	184	141	121	125	104	68	26	2	20	23	69
10	20	21	14	11	9						28	76	128	154	161	164	169	166	155	103	52	53	49	33	82
11	34	4	1	:	3	10	25	30	58	96	122	152	181	185	162	157	156	165	158	114	61	56	71	53	89
12	56	73	78	:	63	57	27	3	15	54	100	131	141	147	140	143	147	140	119	96	67	73	83	84	88
13	71	56	34	:	25	23	17	8	9	13	22	36	93	118	107	92	80	76	75	67	72	61	76	62	56
14	62	57	45	:	33	33	36	39	:	:	71:	78	94	108	118	117	108	100	89	61	37	40	44		68
15											102	137	161	168	182	154	144	133	121	91	36	72	83	69	118
16	54	47	36	:				34	32	53	71	87	91	97	99	102	103	106	97	58	38	44	51	60	68
17	70	55	40	:	24	19	16							94	100	94	96	86	79	59	45	40	39	34	58
18	35	31	26	:	23	11	9	9	17	30	50	64	68	73	87	101	104	104	97	61	32	42	59	69	52
19	78	69	70	43:	42	39	76	64	41	5	22	35	51	58	66	74	85	110	121	80	49	5	0	0	54
20	0	0		:							104	167	169	145	135	138	141	137	119	88	60	46	9	11	92
21	29	42	25	:						76	106		:	:151	154	158	164	169	151	96	61	69	49	27	94
Mean	44	39	36	34	28	28	28	26	34	55	80	103	115	121	121	120	117	114	107	79	51	49	48	42	

TOTAL NUMBER OF OBSERVATIONS = 5239. MEAN = 71.

: INDICATES CALIBRATION DURING THE HOUR

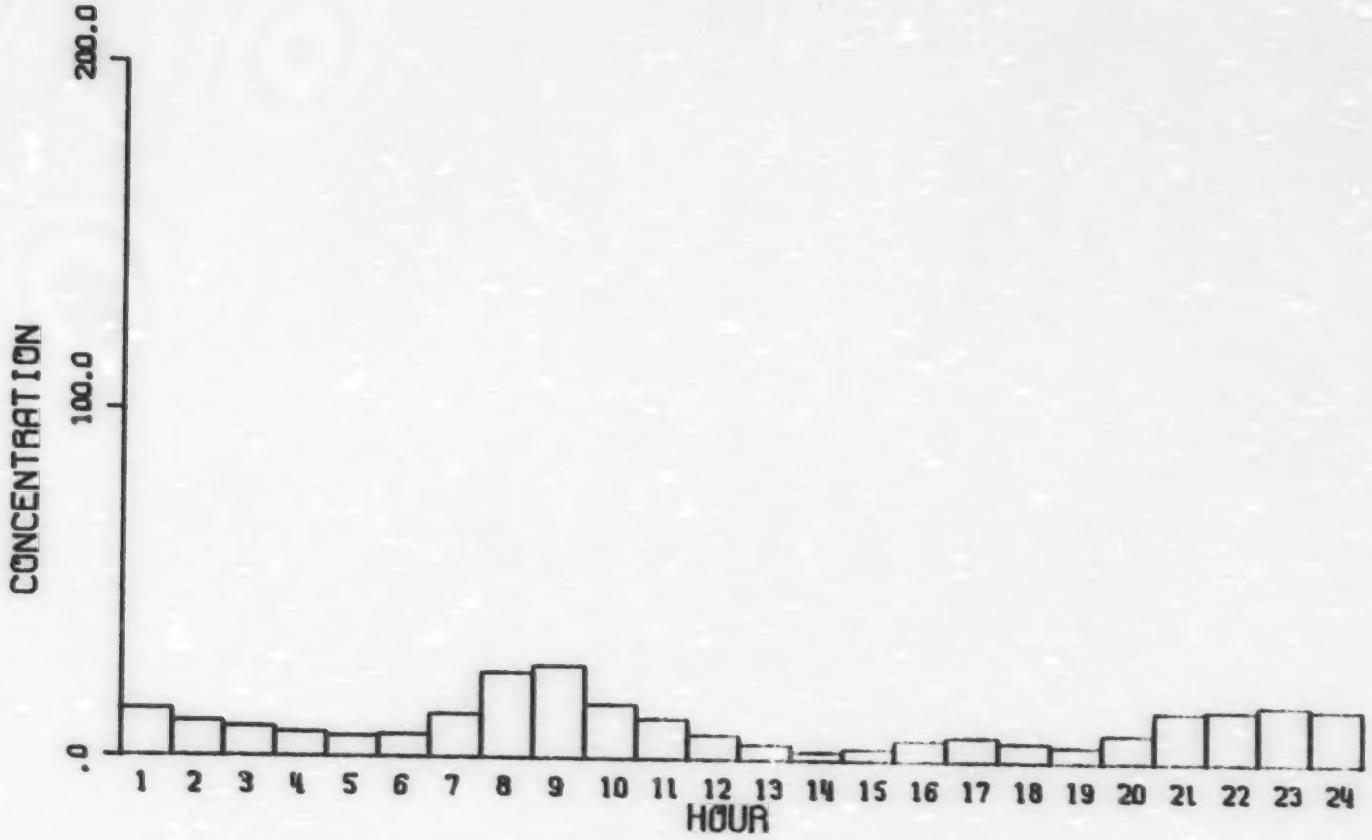
CONCENTRATION
200.0
100.0
.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
DIURNAL VARIATION OF NITROGEN OXIDES(UG/M**3)
SITE - 33

Figure 5-4. Diurnal Variation of Nitrogen Oxides (NO_x) August, 1977, Shreveport, Louisiana

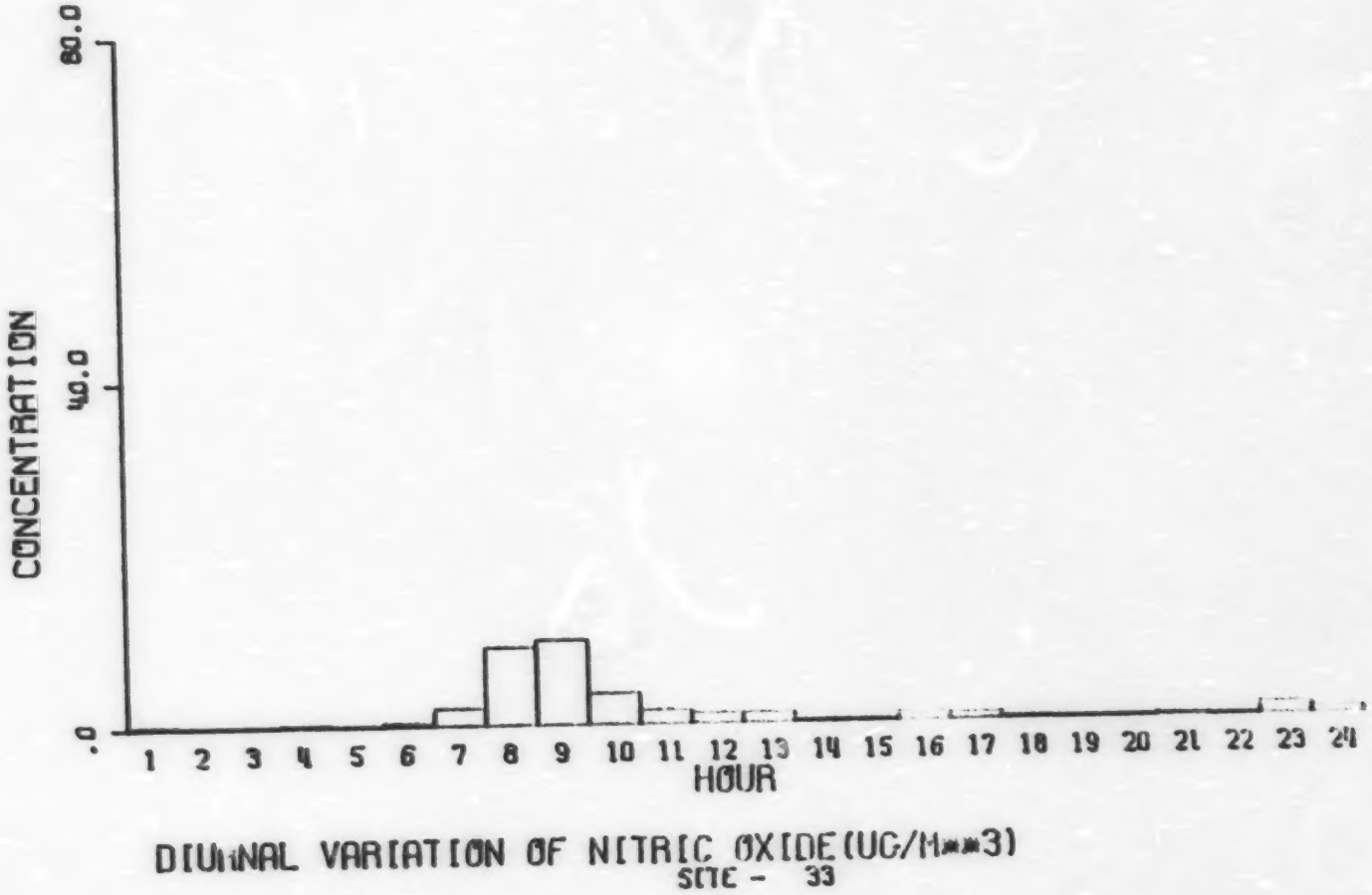
80.0
40.0
.0
CONCENTRATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
DIURNAL VARIATION OF NITRIC OXIDE(UG/M**3)
SITE - 33

Figure 5- 5. Diurnal Variation of Nitric Oxide (NO)
August, 1977, Shreveport, Louisiana

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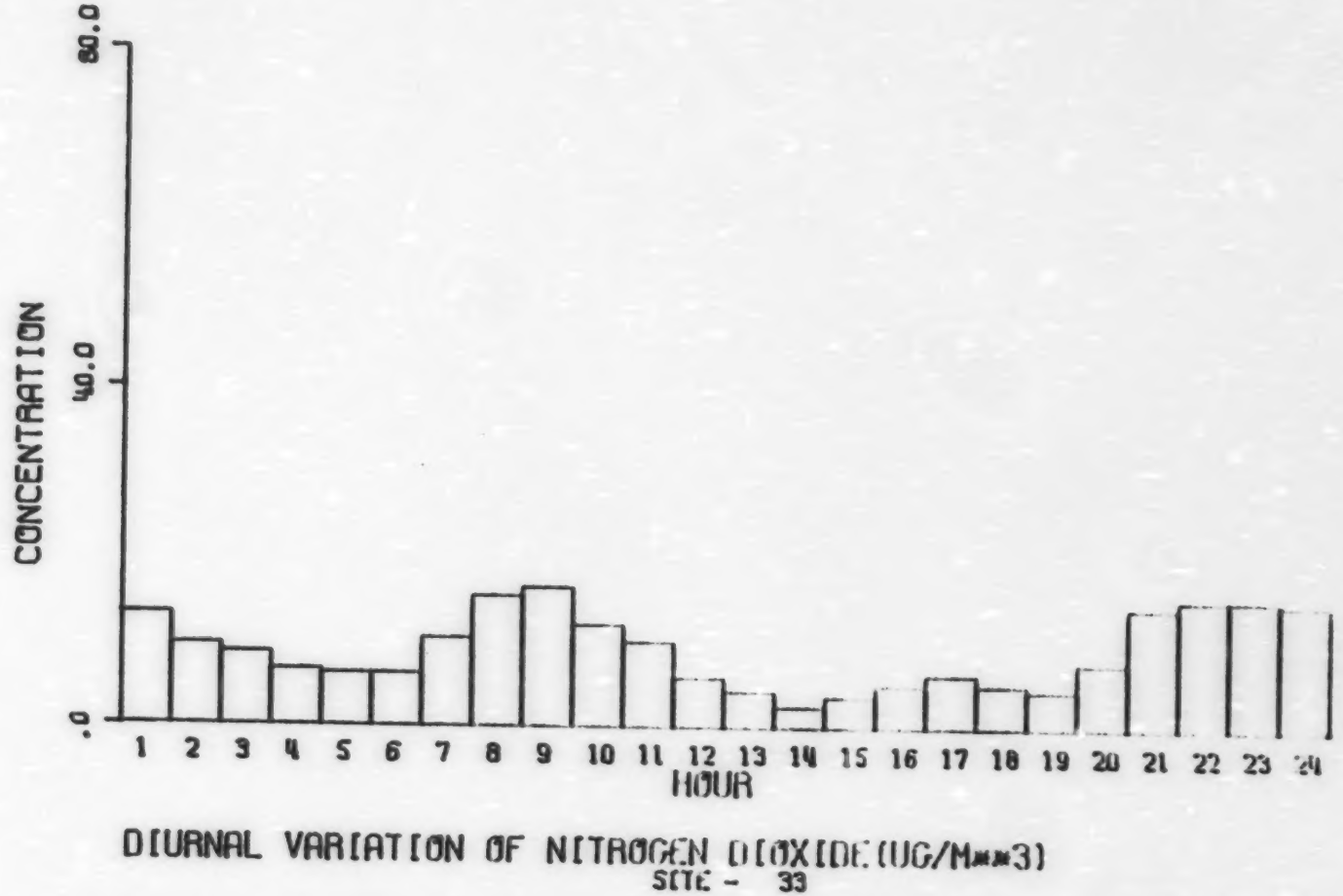
80.0
40.0
.0
CONCENTRATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
DIURNAL VARIATION OF NITROGEN DIOXIDE(UG/M**3)
SITE - 33

Figure 5- 6. Diurnal Variation of Nitrogen Dioxide (NO_2)
August, 1977, Shreveport, Louisiana

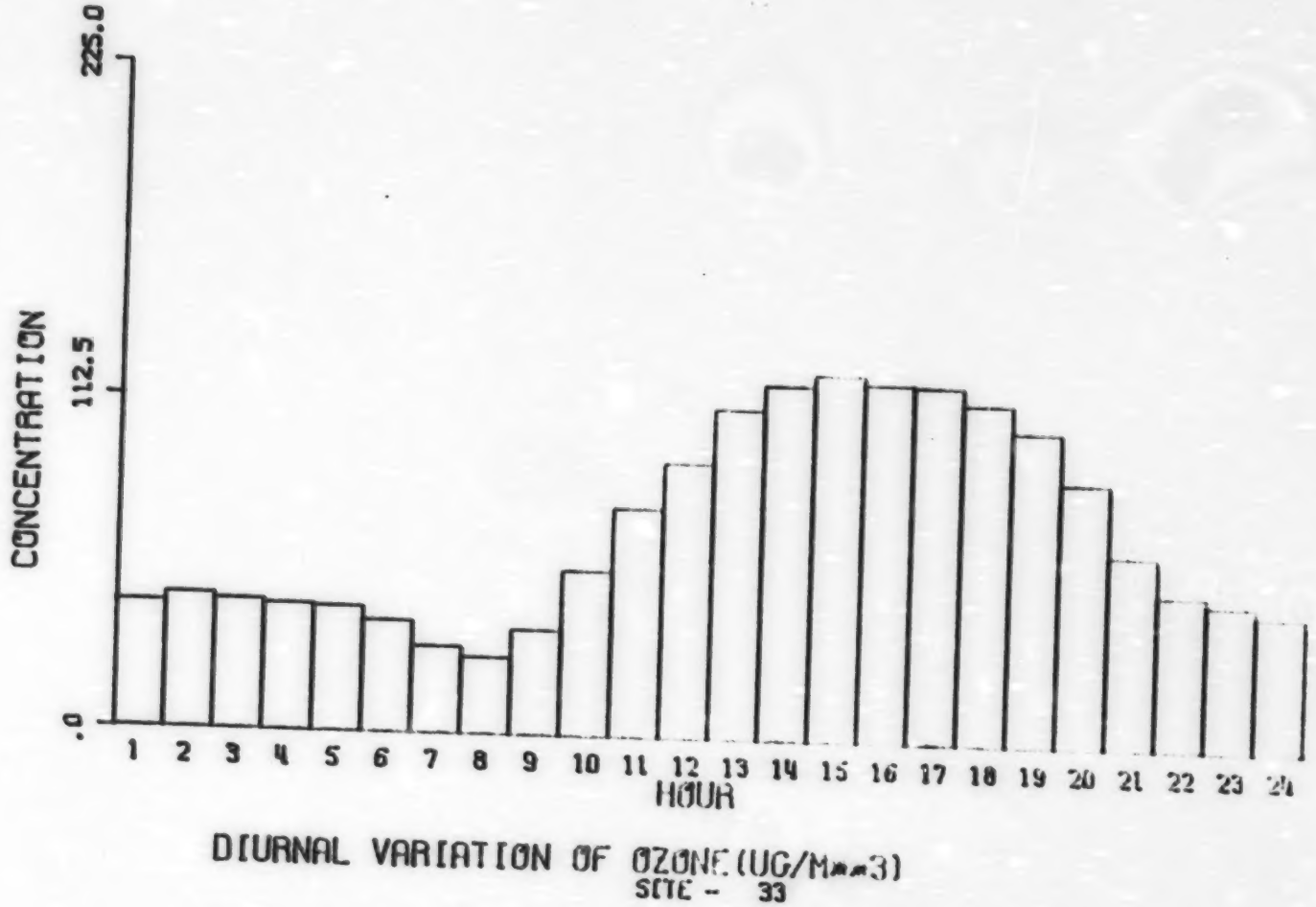

Figure 5-7. Diurnal Variation of Ozone
August, 1977, Shreveport, Louisiana